Journal
of the
Royal Society of Western Australia

Volume 49 Part 1

1.—A census of Pteridophyta of Western Australia

by G. G. Smith*

Manuscript received 21st July, 1964; accepted 23rd November, 1965.

Abstract

Forty-nine species of pteridophyta, including representatives of the Lycopsida, Psilopsida and Pteropsida, are listed for Western Australia. Their distribution within the State is given, as well as brief ecological notes on their habitats.

Introduction

Forty-nine species of ferns and fern allies are now known from Western Australia. They occur over a wide range of climate, from the tropics of the Kimberley and North-West Divisions to the temperate South-West Division and the arid interior of the State.

Plant collectors of the nineteenth and early present centuries collected most of these species during their investigations of the western land flora, but even so, our present knowledge of the distribution of most of them is somewhat fragmentary.

The ferns of the Kimberley are known mainly from the collections of W. V. Fitzgerald made in 1905 and 1906 (Fitzgerald 1916) and those of C. A. Gardner made in 1921 (Gardner 1923) and subsequent years. Other contributions to our meagre knowledge of these ferns were made by Allan Cunningham, Bradshaw and Allan, von Mueller, F. M. House and a few other collectors attached to expeditions of exploration into tropical Western Australia (Gardner 1923; Maiden 1917).

From extra-tropical Western Australia, many records of pteridophytes were obtained when large collections of the land flora were made by Preiss (Lehmann 1846-47), Drummond, Mueller, Oldfield and Diels. Several resident amateur naturalists of the 1800's also contributed to the distribution records of vascular plants, the more ardent collectors, being W. Webb, G. Maxwell, Miss J. Sewell and Miss S. J. Brooks.

Bentham's systematic treatment of the pteridophyta in Flora Australiensis in 1878 brought together, for the first time, the scattered records of Australian ferns. Bentham was able to record only 21 of the 49 species of Western ferns and fern allies, these being mostly the south-western ones. Few of the Kimberley ferns were known at that time.

* Botany Department, University of Western Australia.

Mueller (1882) enumerated the Australian ferns in his first census of Australian plants, but as this listing was partly an abstraction from Flora Australiensis it added nothing to the record for our western pteridophytes. Mueller's second census (Mueller 1889) likewise added nothing to the western fern record. Apart from Mueller's census of the ferns of extra-tropical Western Australia in the Western Australian Year Book for 1864-65 (Mueller 1896) and Andrew's short paper on ferns of the Perth district (Andrews 1902), there were no further publications on the group until 1930 when Gardner listed the pteridophytes in his census of vascular plants of Western Australia (Gardner 1930).

Western Australia still lacks a comprehensive, systematic treatment of its pteridophytes. There is only an illustrated key to ferns in Blackall (1954) by which the south-western pteridophytes may be keyed out. Therefore it is timely to present a census of our fern flora in terms of contemporary nomenclature and classification and to include the distribution records known to date.

Ecology

The western pteridophytes comprise a group of some 24 species of essentially tropical species and a group of some 25 extra-tropical species. The tropical group inhabits the Kimberley Division and part of the coastal portion of the North-West Division, or what Gardner (1942) has termed collectively the Northern Province. All these species occur elsewhere in northern Australia and in the Tropics of the Old World.

The group of extra-tropical species occurs in the southern temperate and arid parts of the State, or South-West Province and Eremean Province respectively, of Gardner (1942).

Fitzgerald (1916) and Gardner (1923) have shown that the fern flora of the Kimberley Division is a poor one for its geographically tropical position because of the scarcity of shade and the prevailing dry conditions between the months of May and October. The Northern Province has a summer rainfall and winter drought, the four consecutive wettest months being December to March or January to April.

This seasonal pattern is obvious from the rainfall data given by the Bureau of Meteorology, Melbourne (1956) in the meteorological summary, "Climatic Averages Australia". In Table 1 an analysis of the average monthly rainfall data taken from this summary is presented for selected weather stations in Western Australia. The data for five stations in the Kimberley Division show the "wet season" to occur consistently from December to March inclusive (the four consecutive wettest months in the year). The periods, June to September or July to October are the four consecutive driest months of the year. In terms of annual rainfall Port George IV (Kunmunya Mission) has a yearly average rainfall of 50.39 inches, Wyndham 25.15 inches, Derby 23.96 inches, Broome 22.87 inches and Halls Creek 18.72 inches.

The summer rainfall pattern of the Kimberley extends over the northern part of the North-West Division where the total rainfall is considerably less than that of the Kimberley (see Table 1).

The Kimberley ferns are mostly restricted to the river forest formation of luxuriant vegetation bordering water-courses of the large valleys and gorges dissecting that rugged land. Within this formation are found *Adiantum philippense*, *Blechnum orientale*, *Ceratopteris thalictroides*, *Cyclosorus gongylodes*, *Dicranopteris linearis*, *Helminthostachys zeylanica*, *Lindsaea ensifolia*, *Lycopodium cernuum*, *Lygodium microphyllum*, *Microsorium scolopendria*, and *Stenochlaena palustris*. *Acrostichum speciosum* inhabits brackish swamps.

The few species which prefer more sunny and drier situations outside the river forest formation are *Platyzoma microphyllum*, *Cheilanthes vellea* and the ubiquitous *Cheilanthes tenuifolia*. The aquatic, *Ceratopteris thalictroides* inhabits water-courses in the Kimberley whilst some species of *Marsilea* are perhaps common in seasonally wet spots throughout the Northern Province and extending into the Eremean Province.

The few species of the tropical group which extend south of the Northern Province are found in small isolated stands in wet and shaded oases in otherwise temperate or arid country. *Psilotum nudum* has recently been collected from a gorge on the Murchison River in the South-West Province. Previous to this collection the only record of this plant in Western Australia, was Fitzgerald's collection from the Kimberley. *Pteris vittata* and *Cyclosorus gongylodes* both occur at Murchison River and again in the lower part of the South-West Province, showing extreme southerly extensions of their tropical distribution range.

The extra-tropical fern group is an impoverished part of the temperate fern flora of southern Australia. None of the species of this group is endemic in this State. Whereas Victoria has some 105 species of fern and fern allies, South Australia some 44 species, southern Western Australia has only 25 species, all of which occur elsewhere in southern Australia.

This fern flora is best developed in the sclerophyll forest formations of the extreme south-west. The South-West Province has a

TABLE 1

Distribution of winter and summer rainfall in Western Australia

Stations	Total Average Rainfall (inches)			
	Four consecutive wettest months	Four consecutive driest months	Four remaining months	Year
Kimberley Division—				
Port George IV (Kunmunya Mission)	(Dec.-Mar.) 43·91	(Jul.-Oct.) 0·79	5·69	50·39
Wyndham	(Dec.-Mar.) 22·23	(Jun.-Sep.) 0·35	2·57	25·15
Derby	(Dec.-Mar.) 21·02	(Jul.-Oct.) 0·43	2·51	23·96
Broome	(Dec.-Mar.) 19·97	(Jul.-Oct.) 0·35	2·55	22·87
Halls Creek	(Dec.-Mar.) 15·45	(Jun.-Sep.) 0·64	2·63	18·72
North-West Division—				
Nullagine	(Dec.-Mar.) 9·45	(Jul.-Oct.) 0·76	2·77	12·98
Marble Bar	(Dec.-Mar.) 8·84	(Jul.-Oct.) 0·72	2·77	12·33
Port Hedland	(Jan.-Apr.) 7·95	(Sep.-Dec.) 0·50	2·56	11·01
Mundiwindi	(Dec.-Mar.) 6·89	(Jul.-Oct.) 1·10	2·59	10·58
Peak Hill	(Jan.-Apr.) 4·97	(Aug.-Nov.) 1·01	3·35	9·33
Winning Pool	(Jan.-Apr.) 5·06	(Sep.-Dec.) 0·45	3·39	8·90
South-West Division—				
Karridale	(May-Aug.) 31·42	(Dec.-Mar.) 4·22	11·98	47·63
Kalamunda	(May-Aug.) 29·50	(Nov.-Feb.) 2·86	10·45	42·81
Manjimup	(May-Aug.) 26·67	(Dec.-Mar.) 3·92	11·98	42·57
Collie	(May-Aug.) 26·09	(Dec.-Mar.) 3·04	10·47	39·60
Perth	(May-Aug.) 25·55	(Nov.-Feb.) 2·12	8·32	35·99
Mount Barker	(May-Aug.) 15·70	(Dec.-Mar.) 4·71	9·82	30·23
Waleibing	(May-Aug.) 13·24	(Nov.-Feb.) 1·89	5·07	20·20
Katanning	(May-Aug.) 11·26	(Nov.-Feb.) 2·52	5·65	19·43
Morawa	(May-Aug.) 8·06	(Oct.-Jan.) 2·15	3·74	13·95
Kellerberrin	(May-Aug.) 7·94	(Nov.-Feb.) 2·07	3·88	13·89
Eastern and Eucla Divisions—				
Eucla	(Apr.-Jul.) 4·29	(Nov.-Feb.) 2·40	3·28	9·97
Wiluna	(Jan.-Apr.) 5·44	(Aug.-Nov.) 1·11	3·23	9·80
Menzies	(Mar.-Jun.) 4·23	(Aug.-Nov.) 1·92	3·17	9·32
Sandstone	(Mar.-Jun.) 4·00	(Sep.-Dec.) 1·60	3·51	9·11
Balladonia	(May-Aug.) 3·33	(Nov.-Feb.) 2·59	3·03	8·95
Laverton	(Dec.-Mar.) 3·96	(Jul.-Oct.) 1·58	3·13	8·67
Rawlinna	(Mar.-Jun.) 2·59	(Jul.-Oct.) 1·89	2·15	6·63

winter rainfall and summer drought. From Table 1 it will be seen that there is a marked winter rainfall from May to August inclusive (the four consecutive wettest months of the year). The four consecutive driest months are November to February or December to March. The average annual isohyet of 50 inches encloses a small area between Pemberton and Nornalup in the extreme south and occasional outliers along the Darling Scarp. The annual rainfall decreases northwards (Karridale 47.63 inches, Perth 35.99 inches, Walebing 20.20 inches, Morowa 13.95 inches) and eastwards (Karridale 47.63 inches, Manjimup 42.57 inches, Mount Barker 30.23 inches, Katanning 19.43 inches, Kellerberrin 13.89 inches). Consequent upon this climatic pattern there is a progressive decrease eastwards and northwards of the sclerophyll forest and the fern flora.

The woodland ferns of the sclerophyll forest formation of the Karri and Jarrah forests include *Pteridium esculentum*, *Lindsaea linearis* and *Adiantum aethiopicum*. Amongst outcrops of igneous rocks or metasediments are found *Anogramma leptophylla*, *Asplenium flabellifolium*, *A. adiantoides*, *Cheilanthes tenuifolia*, *Ch. distans*, *Ch. lasiophylla* and *Pleurosorus rutifolius*. The Spleenwort, *Asplenium trichomanes* is restricted to limestone outcrops of the extreme south western corner of the State. The lycopsids, *Phylloglossum drummondii*, *Selaginella gracillima*, *Isoetes drummondii* and the Combfern, *Schizaea fistulosa*, inhabit soils which are saturated or inundated in winter and extremely dessicated in summer. *Lycopodium carolinianum* is limited to peaty swamps which remain moist throughout the year.

The Eastern and Eucla Divisions as well as the southern part of the North-West Division constitute the Eremean Province of Gardner (1942). This vast central area is a region of very low and unreliable rainfall of no marked periodicity (see Table 1). Ferns are rare in this Province and include a few species of the rock-fern genera *Cheilanthes*, *Pleurosorus*, *Gymnogramma* and the ubiquitous *Ophioglossum lusitanicum*. A few species of the aquatic genera, *Marsilea* and *Isoetes* inhabit ephemeral waters of rock pools, clay pans and creek beds.

In arranging the families of pteridophyta for this census the classification of Eames (1936) is followed for the Lycopsida and Psilopsida, whilst the scheme of Copeland (1947) is adopted for the Pteropsida except for the following departures. I have followed several contemporary pteridologists in recognising the segregation of the Thelypteridaceae from the Aspidiaceae of Copeland's scheme and in segregating the Azollaceae from the Salviniaceae as did Christensen (1938) and Holttum (1954). I have also followed the splitting of the Pteridaceae of Copeland into four families as proposed by Alston (1956) and Alston's placing of the genus *Stenochlaena* in the Polypodiaceae rather than in the Blechnaceae of Copeland.

With regard to the genera of ferns represented in Western Australia, I have used Alston's segregation of Copeland's Pteridaceae into Dennstaedtiaceae to include *Microlepia* and *Pteridium;* Lindsaeaceae for *Linasaea* and Adiantaceae to include *Acrostichum*, *Adiantum*, *Ceratopteris*, *Cheilanthes*, *Pteris*, *Anogramma*, *Gymnogramma* and *Platyzoma*. The last named genus has been referred to the Adiantaceae by Tindale (1962).

LYCOPSIDA

LYCOPODIALES

LYCOPODIACEAE

Lycopodium Linnaeus

Lycopodium carolinianum Linnaeus, *Sp. Pl.* 2: 1104 (1753).

Lycopodium serpentinum Kunze in *Lehm. Pl. Preiss.* 2: 108 (1847).

Lycopodium drummondii Spring, *Mém. Acad. Roy. Belg.* 24: 35 (1849).

Southern temperate Australia, New Zealand, Indonesia, Malaya, Ceylon, Mascarene Is., tropical and S. Africa, New Guinea, N. and S. America.

W. Aust. Restricted to wet, peaty soils in the lower South-West. Muchea (UWA, PERTH), on peaty soils of mound springs. Bayswater, near Perth (NSW). Albany district (UWA, PERTH, MEL), common on peaty soils of swamps, often associated with the pitcher plant, *Cephalotus follicularis*. Marbellup (Diels and Pritzel 1905).

Lycopodium cernuum Linnaeus *Sp. Pl.* 1103 (1753).

Pantropical. Northern Australia and New South Wales. New Zealand.

W. Aust. Charnley River in West Kimberley (PERTH, NSW. Fitzgerald 1916); Cambridge Gulf (MEL).

Lycopodium volubile Forster, *Flor. Ins. Aust. Prod.* 86 (1786).

Malaya, Indonesia, New Guinea to Polynesia. New Caledonia, Northern Australia, New Zealand and Chatham Is.

W. Aust. Glenelg district, West Kimberley (MEL). Spring (1849-50) quoted this species from King George's Sound, W. Aust., but I have not seen any specimen from this region.

Phylloglossum Kunze

Phylloglossum drummondii Kunze in *Bot. Zeitg.* 1: 721 (1843).

Temperate Australia and New Zealand.

W. Aust. Bindoon (PERTH); Kalamunda (UWA) and elsewhere in the Darling Range in shallow loam over granite; Cannington (UWA) and elsewhere in swampy soils of the coastal plain close to the Darling Scarp; Harvey (PERTH); Kojonup (UWA); Yornup (PERTH); Manjimup (UWA); Northcliffe (PERTH); Lake Muir (UWA); Stirling Range (MEL); Albany (PERTH).

SELAGINELLALES

SELAGINELLACEAE

Selaginella de Beauvois

Selaginella ciliaris (Retzius) Spring in *Bull. Acad. Brux.* 10: 231 (1843).

Lycopodium ciliare Retzius, *Obs.* 5: 32, no. 92 (1789).

Lycopodium pumilio R. Brown, *Prod.* 166 (1810).

Selaginella pumilio (R. Brown) Spring in *Bull. Acad. Brux.* 10: 232 (1843).

Selaginella belangeri (Bory) Spring in *Mém. Acad. Roy. Belg.* 24: 242 (1850).

India, southern China to northern Australia (Tindale 1958).

W. Aust. Between Isdell River and Mount Bartlett (PERTH); Isdell River, in clefts of wet rocks (Fitzgerald 1916).

Selaginella gracillima (Kunze) Alston, in *J. Bot. Lond.* 69: 257 (1961).

Lycopodium gracillimum Kunze in *Lehm. Pl. Preiss* 2: 109 (1847).

Selaginella preissiana Spring in *Mém. Acad. Roy. Belg.* 24: 61 (1849).

Temperate Australia.

W. Aust. Widely distributed in the South-West, in habitats ranging from clay flats of coastal and inland swamps to moss swards on granite outcrops. Hutt River near Northampton (PERTH); Hill River (UWA); Greenough and Irwin Rivers (MEL); Chittering (UWA); Mundaring (UWA) and elsewhere in the Darling Range; Guildford (MEL); Cannington (UWA) and elsewhere in swampy places on the coastal plain close to the Darling Scarp; Beverley (UWA); York (MEL); Yorkrakine Rock near Wyalkatchem (UWA); Quairading (UWA); Preston River (MEL); Bridgetown (UWA); Pemberton (UWA); Shannon River (UWA); Franklin River (PERTH); Blackwood River (MEL); Witchcliffe (UWA); Stirling Range (MEL).

Selaginella uliginosa (Labillardière) Spring in *Bull. Acad. Brux.* 10: 136 (1843).

Lycopodium uliginosum Labillardière, *Fl. N. Holl. Pl. Sp.* 2: 104, t. 251 f. 2 (1806).

Tropical and southern Australia.

W. Aust. Apparently rare. King George's Sound (MEL).

ISOETALES

ISOETACEAE

Isoetes Linnaeus

Isoetes drummondii A. Braun in *Monatsber. Akad. Wiss., Berl.* 593 (1863) 1864 and 542 (1868).

Temperate Australia.

W. Aust. Banks of creeks, shallow loams over granite and elsewhere in clay or sandy soils becoming inundated with water in winter. Mingenew (UWA); Toodyay (Pfeiffer 1922); York (UWA); Brookton (UWA); Tinkurrin (UWA); Cannington and elsewhere near Perth (PERTH, UWA); Harvey (PERTH); Bridgetown (UWA); Wilgarup (PERTH); Hamersley Range (Diels and Pritzel 1905).

Isoetes humilior F. Mueller ex A. Braun in *Linnaea* 25: 722 (1853).

Widespread in temperate Australia (Willis 1962).

W. Aust. Middle Island, Recherche Arch., (MEL); Mt. Belches (MEL); Ballidu (MEL). Inhabiting shallow and ephemeral waters of pools on granite outcrops.

Isoetes spp.

The herbarium of the University of Western Australia has collections of small aquatic *Isoetes* from rock pools in many localities in the southern part of Western Australia. Preliminary investigation of these collections has shown that there is considerable variation of morphology in populations from different localities. None of these forms satisfactorily agree with the description of *Isoetes humilior*. These forms and the western populations of the swamp species, *Iscetes drummondii* require thorough investigation.

PSILOPSIDA

PSILOTALES

PSILOTACEAE

Psilotum Swartz

Psilotum nudum (Linnaeus) Grisebach in *Veget. d. Karaiben* 130: 1857.

Lycopodium nudum Linnaeus, *Sp. Pl.* 2, 1100 (1753).

Psilotum triquetrum Swartz in *Schrad. J. Bot.* 109: (1800)[2] (1801).

Pantropical with extensions into moist subtropical regions. In Australia, *Psilotum* occurs in northern tropical Australia, Central Australia, New South Wales, and the Grampians in Victoria. It also occurs on Lord Howe and Norfolk Islands and in New Zealand.

W. Aust. Sprigg and Charnley Rivers in the Kimberley Division (PERTH, Fitzgerald 1916). A recent collection from Galena on the Murchison River (UWA), has considerably extended the known southerly limit of this species in Western Australia (Smith and Butler 1961).

PTEROPSIDA

OPHIOGLOSSALES

OPHIOGLOSSACEAE

Helminthostachys Kaulfuss

Helminthostaehys zeylanica (Linnaeus) Hooker, *Gen. Fil. t.* 47 (1840).

Osmunda zeylanica Linnaeus, *Sp. Pl.* 2: 1063 (1753).

Ceylon and India through Malaysia and Formosa to the Caroline Islands and New Caledonia (Copeland 1947). Tropical Australia.

W. Aust. Marie Springs on the Prince Regent River, West Kimberley (PERTH).

Ophioglossum Linnaeus

Ophioglossum lusitanicum ssp. coriaceum (Cunningham) Clausen in *Mem. Torrey bot. Club* 19: 161 (1938).

Ophioglossum coriaceum Cunningham in *Hook. Compan. bot. Mag.* 2: 361 (1837).

Bolivia, Chile, Easter Is., New Caledonia, Australia (including Tasmania) and New Zealand (Clausen 1938).

W. Aust. Cape Range (PERTH); 80 miles south of Learmonth (PERTH); Minilya River (PERTH); Mingenew (Andrews 1902, Diels and Pritzel 1905); New Norcia (UWA); Wongan Hills (PERTH, MEL); Toodyay (Diels and Pritzel 1905); Goomalling (PERTH); Bullfinch (PERTH); Bindoon (PERTH); Bruce Rock (UWA); Yorkrakine Rock near Wyalkatchem (UWA); Kalamunda (UWA) and elsewhere in the Darling Range; Guildford and Fremantle (Fitzgerald 1901); Medina (PERTH); Noman's Lake east of Narrogin (UWA); Pallarup Rocks, S.E. of Lake King (PERTH); Porongurup Range (UWA); Cue (PERTH); Payne's Find (PERTH);

Leonora (PERTH); Laverton (PERTH); Mt. Beadell, north of Warburton Range (PERTH); Karonie (PERTH); Balladonia (MEL).

FILICALES

SCHIZAEACEAE

Lygodium Swartz

Lygodium microphyllum (Cavanilles) R. Brown, *Prod.*, 162 (1810).

Ugena microphylla Cavanilles in *Ic. Descr. Pl.* 6: 76, t. 595 (1801).

Lygodium scandens (Linnaeus) Swartz in *Schrad. J. Bot.* 106 (1800)[2] (1801).

Lygodium scandens var. *microphyllum* (Cavanilles) Luerssen, in *J. Mus. Godeffr.* 6: 4 (1874).

Ophioglossum scandens Linnaeus, *Sp. Pl.* 1063 (1753).

Tropical and subtropical Africa, Asia and Australia, Polynesia.

W. Aust. Common throughout the Kimberley Division, in the river forest formation, (Gardner 1923). Isdell, Sprigg, Hann, Charnley and Calder Rivers, Dillon's Springs and Sunday Is., in West Kimberley (Fitzgerald 1916). Sunday Is. (NSW); Isdell River (PERTH); Imidjin Creek in McDonald Range (PERTH); Deception Range (PERTH, CANB); Thompson's Springs on Ord River (PERTH); Sprigg River in Synnott Range (PERTH); Moran River (PERTH); west of Cambridge Gulf (MEL).

Schizaea J. Smith

Schizaea fistulosa Labillardière, *Nov. Holl. Pl. Specim.* 2: 103 (1807).

Southern Australia, New Zealand, Chile, Borneo, Madagascar, Fiji, New Caledonia (Holttum 1959).

W. Aust. Restricted to peaty and swampy soils of the South-West. Muchea (PERTH); Bayswater (UWA); Pemberton (PERTH); Northcliffe (PERTH); Albany (PERTH, AD. Andrews 1902); Walpole (UWA); Blackwood River (PERTH); King George's Sound (PERTH, Diels and Pritzel 1905); Plantagenet district (NSW, leg. Preiss).

GLEICHENIACEAE

Dicranopteris Bernhardi

Dicranopteris lincaris (Burmann f.) Underwood, in *Bull. Torrey Bot. Club* 34: 250 (1907).

Polypodium lineare Burmann f. *Fl. Ind. 235.* t. 67. f. 2. (1768).

Gleichenia dichotoma Hooker, *Sp. Fil.* 1: 12 (1844).

Gleichenia linearis (Burmann f.) Clarke in *Trans. Linn. Soc. Lond.* 1: 428 (1880).

Gleichenia hermannii R. Brown, *Prod.* 161 (1810).

Dicranopteris hermannii (R. Brown) Nakai in *Bull. Nat. Sci. Mus. Tokyo* No. 29: 60 (1950).

Tropical and subtropical regions of Africa, Asia. Malaysia, Australia and Polynesia (Pichi-Sermolli 1962). Tropical America (Nakai 1950).

W. Aust. Confined to wet habitats in the Kimberley Division. Hunter River at York Sound (MEL, leg. Cunningham); Charnley River (PERTH, Fitzgerald 1916); Imidjin Creek (PERTH); Mt. Agnes (PERTH); Prince Regent River (Gardner 1923).

DENNSTAEDTIACEAE

Microlepia Presl

Microlepia speluncae (Linnaeus) Moore, *Index Fil.* xciii (1857).

Polypodium speluncae Linnaeus, *Sp. Pl.* 2: 1093 (1753).

Pantropical, extending south to Madagascar and New Zealand (Copeland 1947).

W. Aust. West Kimberley (PERTH). A single barren specimen from the Brockman Expedition of 1901.

Pteridium Scopoli

Pteridium esculentum (Forster f.) Nakai in *Bot. Mag. Tokyo* 39: 108 (1925).

Pteris esculenta Forster f., *Pl. Escul.* 74 (1786).

Temperate Australia, New Caledonia, New Zealand and Polynesia.

W. Aust. Common in the lower South-West between Perth and Albany and particularly abundant in the Karri forest formation. According to Gardner and Bennetts (1956), this species extends as far north as Port Gregory, north of Geraldton. Gingin (PERTH); Swan River (MEL, PERTH); Harvey (UWA); Margaret River (PERTH); Pemberton (UWA); Northcliffe (UWA); Shannon River (UWA); Wilson's Inlet (NSW); Bow River (NSW, UWA); Blackwood River (MEL); Porongurup Range (UWA); King George's Sound (UWA, MEL).

LINDSAEACEAE

Lindsaea Dryander in J. Smith

Lindsaea ensifolia Swartz in *Schrad. J. Bot.* 77 (1800)[2], (1801).

Schizoloma ensifolium (Swartz) J. Smith in *J. Bot.* 3: 414 (1841).

West and South Africa, Madagascar, Tropical Asia, Northern Australia to Polynesia (Tindale 1958).

W. Aust. Throughout the Kimberley. Mitchell River, in moist humid valleys among sandstone rocks on banks of streams (Gardner 1923). Lawley River (PERTH); Charnley River (PERTH); Thompson's Springs on the Ord River (PERTH, MEL); Napier Broome Bay (MEL); Derby (MEL); Grant Range (NSW).

Lindsaea linearis Swartz in *Schrad. J. Bot.* 78 (1800)[2], (1801).

Throughout southern Australia and Tasmania, New Caledonia, New Zealand.

W. Aust. Common in the sclerophyllous forests and scrub country of the lower South-West. Jarrahdale (PERTH) and elsewhere in the Darling Range. Vasse River (MEL); Donnybrook (UWA); Collie (UWA); Bridgetown (UWA); Manjimup (UWA) and elsewhere in the Karri forest; Yallingup and Cape Naturaliste (Domin 1912); Nornalup (UWA); Bow River (NSW, UWA); Scott River (UWA); Mt. Barker (PERTH); Porongurup Range (MEL); Albany (PERTH, MEL); Mt. Le Grande (PERTH).

ADIANTACEAE

Acrostichum Linnaeus

Acrostichum speciosum Willdenow, *Sp. Pl.* 5: 117 (1810).

Tropical Asia and Australia, in salt or brackish swamps at the back of mangroves or along tidal creeks (Tindale 1958).

W. Aust. Kimberley and North-West. East Kimberley (PERTH); Isdell River near Walcott Inlet (PERTH); Sunday Is., (PERTH, NSW, Fitzgerald 1916 as *Acrostichum aureum* L.). Derby (NSW); Nickol Bay (MEL). The specimens in PERTH have been referred to as *A. aureum* L., but are in fact, *A. speciosum*.

Adiantum Linnaeus

Adiantum aethiopicum Linnaeus, *Syst. Nat. ed.* 10, 2: 1329 (1759).

Australia and New Zealand, South Africa (Pichi-Sermolli 1957).

W. Aust. Confined to the lower South-West, along creeks and rivers in the Jarrah and Karri forests, or in the shelter of rock outcrops. Mundaring (PERTH); Serpentine River (UWA, MEL) and elsewhere in the Darling Range. Harvey River (MEL); Bunbury (MEL); Donnybrook (PERTH); Meelup (UWA); Collie (PERTH); Bridgetown (PERTH); Margaret River (UWA); Blackwood River (MEL); Manjimup (UWA); Pemberton (UWA, MEL, PERTH); Walpole (UWA); Lake Muir (MEL); King George's Sound (MEL); Porongurup Range (UWA, MEL, NSW); Stirling Range (MEL).

Adiantum capillus-veneris Linnaeus, *Sp. Pl.* 2: 1096 (1753).

Tropical, subtropical and warm temperate zones of the world (Pichi-Sermolli 1957).

W. Aust. Wittenoom Gorge, in Hammersley Range (PERTH, UWA, MEL). Apparently very rare and restricted to oases in otherwise arid country, as is the case for this species in arid parts of Ethiopia (Pichi-Sermolli 1957).

Adiantum philippense Linnaeus, *Sp. Pl.* 2: 1094 (1753).

Adiantum lunulatum Burmann f., *Fl. Ind.*, 235 (1768).

Tropics of the Old World (Pichi-Sermolli 1957).

W. Aust. Kimberley Division. King Sound (Fitzgerald 1916); Wingrah Pass in Napier Range (PERTH, Fitzgerald 1916); on limestone near Barker River Gorge in Napier Range (PERTH, Gardner 1923); Derby (NSW).

Anogramma Link

Anogramma leptophylla (Linnaeus) Link, *Fil. Sp. cult.*, 137 (1841).

Polypodium leptophyllum Linnaeus, *Sp. Pl.* 2: 1092 (1753).

Pityrogramma leptophylla (Linnaeus) Domin in *Publ. Fac. Sci. Univ. Charles*, No. 88: 9 (1928).

Grammitis leptophylla Swartz, *Syn. Fil.*, 23: 218 (1806).

Gymnogramma leptophylla Desvaux, *Mag. Ges. Nat. Freunde Berl.* 5: 305 (1811).

Temperate and subtropical regions of the Old and New Worlds.

W. Aust. Common in shaded recesses of both limestone and granitic rocks throughout the South-West. Helena River and elsewhere in the Darling Range (UWA); limestone cliffs in the King's Park, Perth (UWA, NSW); Hill River Springs (MEL); Yanchep (UWA); Claremont, near Perth (Andrews 1902); Mandurah (UWA); Yallingup (PERTH, Ostenfeld, 1918); Margaret River (UWA); Vasse River (MEL, leg. Preiss); Porongurup Range (UWA); Lake Deborah (Helms in Mueller and Tate 1896).

Ceratopteris Brongniart

Ceratopteris thalictroides (Linnaeus) Brongniart in *Bull. Sci. Soc. Philom.* 186 (1821)[2] (1822).

Acrostichum thalictroides Linnaeus, *Sp. Pl.* 2. 1070 (1753).

Widespread in tropical East Africa, Madagascar, the Seychelles and Mascarene Islands, and in tropical and subtropical Asia and Australia (Pichi-Sermolli 1957).

W. Aust. An aquatic of river margins and marshes in the Kimberley and North-West Divisions. Isdell, Adcock and Charnley Rivers, Woolybut Creek, in the Kimberleys (Fitzgerald 1916) (PERTH); Walcott Inlet, Sale, Glenelg and Calder Rivers, Bachsten Creek, in the Kimberley (Gardner 1923, PERTH); Millstream on the Fortescue River (PERTH).

Cheilanthes Swartz

Cheilanthes distans (R. Brown) Mettenius, *Abh. senckenb. naturf. Ges.* 3: 69 (1859).

Notholaena distans R. Brown, *Prod.* 146 (1810).

Throughout Australia except Tasmania, New Zealand, Polynesia, Celebes.

W. Aust. Inhabiting shallow loam of rocky places throughout the South-West and South-East. Karunjie Station, Kimberley (CANB); Darlington and elsewhere in the Darling Range (PERTH, UWA, MEL); Toodyay (PERTH); York (MEL); Harvey (MEL); Lowden (MEL, NSW); Mount Magnet (Moore, S. le M., 1899); Kalgoorlie (Ostenfeld 1918); Salt River (MEL); West River, Eyre District (MEL); Eucla (MEL); Fraser Range (PERTH, MEL).

Cheilanthes lasiophylla Pichi-Sermolli in *Webbia* 8: 209 (1951).

Nothochlaena canescens Kunze in *Lehm. Pl. Preiss.* 2: 110 (1846).

non *Cheilanthes canescens* Kunze 1847a.

Nothclaena vellea sens. auctt. non strict. R. Brown, *Prod.* 146 (1810).

Notholaena brownii sens. auctt. Aust. plur., non Desveaux, *Prod.* 220 (1827).

Australia, particularly in the more arid regions.

W. Aust. Deception Range, West Kimberley (CANB); Abydos, S. of Port Hedland (MEL); Wittenoom Gorge (MEL); Cape Range (PERTH); Gascoyne River (MEL); Champion Bay (MEL); Yandanooka (UWA); Mundaring (UWA); Southern Cross (UWA); Kellerberrin (AD); Mt. Caroline (MEL); Lake Barlee (UWA, MEL); Lawlers (PERTH); Glen Cummin Gorge, Rawlinson Range (AD); Warburton Mission (PERTH); Norseman (PERTH); Fraser Range (MEL, PERTH); Balladonia (MEL).

Cheilanthes tenuifolia (Burmann f.) Swartz, *Syn. Fil.* 129 (1806).

Trichomanes tenuifolium Burmann f., *Fl. Ind.* 237 (1768).

India and China through Malaysia to Australia and Polynesia. New Zealand.

W. Aust. Throughout the State and abundant in the South-West. Mostly inhabiting shallow loam over granite, often forming extensive swards in both shaded and sunny situations. Cambridge Gulf (MEL); Camden Sound (MEL); Lennard River (PERTH); Isdell River (PERTH); Prince Regent River (MEL, PERTH); Synnott Range (PERTH); King Sound (NSW); Derby (NSW); and elsewhere in the Kimberley. Nickol Bay (MEL); Quartz Hill near Roebourne (PERTH); Cape Range (PERTH); Marble Bar (PERTH); Wittenoom (MEL); Gascoyne River (MEL); Beringarra (CANB); Meekatharra (PERTH); Mt. Magnet (PERTH, MEL) and elsewhere in the North-West Division. Coolgardie (NSW); Lake Barlee (MEL); Laverton (PERTH); Warburton Range (PERTH); Lake Deborah (MEL); Rawlinson Range (MEL) and elsewhere in the Eastern Division. Murchison River (MEL, PERTH); Geraldton (MEL); Northampton (PERTH); Dandaragan (UWA); Wongan Hills (UWA); Yorkrakine (UWA); Darlington and elsewhere in the Darling Range (PERTH, MEL. UWA); York (MEL); Kellerberrin (UWA, NSW); Busselton (MEL); Wagin (MEL); Narrogin (UWA); Blackwood River (MEL); Bow River (UWA); Cape Leeuwin (MEL); Pemberton (MEL); Porongurup Range (UWA, MEL, NSW); Stirling Range (NSW, MEL, PERTH); King George's Sound (MEL, UWA); Bremer Bay (MEL, PERTH) and elsewhere in the South-West Division. Fraser Range (MEL); Mt. Ragged (MEL); Recherche Arch., (MEL, Willis 1953); Cape Arid (MEL); Israelite Bay (MEL); and elsewhere in the Eastern Division.

Cheilanthes vellea (R. Brown) F. Mueller in *Fragmenta* 5: 123 (1866).

Notholaena vellea R. Brown, *Prod.* 146 (1810).

Notholaena brownii Desveaux, *Prod.* 220 (1827).

Tropical and more arid parts of subtropical Australia.

W. Aust. Napier Broome Bay (MEL); Cambridge Gulf (MEL); Ord River (MEL); In sandy soil on rises amongst quartzite rocks—Prince Regent, Mitchell and King Edward Rivers (Gardner 1923, PERTH); Glenelg River (PERTH); King Sound (MEL); Talga Station in Barlee Range (PERTH); Carson River (MEL); Quartz Hill near Roebourne (PERTH); Yorkrakine Rock near Wyalkatchem (UWA).

Gymnogramma Desveaux

Gymnogramma reynoldsii (F. Mueller) Black, *Flora Sth. Aust.* 40 (1922).

Grammitis reynoldsii (F. Mueller) ex Bentham, *Flora Aust.*, 8: 775 (1878).

Nothochlaena reynoldsii F. Mueller, in *Fragmenta* 8: 175 (1874).

Arid interior of Australia.

W. Aust. Cavenagh Range (Mueller and Tate 1896). The few other records of this rare fern include Flinders, Everard, Berksgate and Musgrave Ranges in Sth. Aust. (AD); Stanley Chasm in the McDonnell Range, Mt. Olga in Northern Territory (MEL); Ulambaura Springs, Northern Territory (PERTH); Stuart Range, Northern Territory (MEL).

Copeland (1947) claims that *Gymnogramma* Desveaux is a synonym of *Gymnopteris* Bernhardi and suggests that this fern presumably belongs to *Paraceterach* (F. Mueller) Copeland. Dr. M. D. Tindale is presently investigating the uncertain systematic position of this fern.

Platyzoma R. Brown

Platyzoma microphyllum R. Brown, *Prod.* 160 (1810).

Gleichenia platyzoma F. Mueller, *Veg. Chatham Is.* 63 (1864).

A monotypic genus confined to arid parts of tropical and subtropical Australia. West Australia, Northern Territory, Queensland, New South Wales, South Australia.

W. Aust. Throughout the Kimberley Division. Napier Broome Bay (MEL); Glenelg River (MEL, PERTH); Mt. Agnes (PERTH); Gibb River (PERTH, MEL, NSW); Ord River (PERTH, MEL, NSW, CANB); Isdell River (PERTH); Sources of the Calder, Charnley, Glenelg, Prince Regent, Moran and King Edward Rivers (Gardner 1923); Burt Range (UWA); "common on the central plateau around Mt. Agnes, in sandy, swampy soils in open places, forming dense colonies of many feet in diameter"—Gardner 1923.

Pteris Linnaeus

Pteris vittata Linnaeus, *Sp. Pl.* 2: 1074 (1753).

Widely distributed in the tropics and subtropics of the Old World (Holttum 1954). Tropical Australia, extending into New South Wales and Victoria on the east coast and to the south west of Western Australia.

W. Aust. Wittenoom Gorge in Hammersley Range (PERTH, UWA, MEL); Yanchep (UWA); Yallingup Caves (Fitzgerald 1903 as *Pteris longifolia* L.) Deepdene, near Augusta (UWA).

POLYPODIACEAE

Microsorium Link

Microsorium scolopendria (Burmann f.) Copeland in *Univ. Calif. Publ. Bot.* 16: 112 (1929).

Phymatodes scolopendria (Burmann f.) Ching in *Contr. Inst. Bot. Nat. Acad. Peiping* 2: 63 (1933).

Polypodium scolopendria Burmann f. in *Fl. Ind.* 232 (1768).

Polypodium phymatodes Linnaeus, *Mant. Pl.*, 306 (1771).

Tropical Africa, Ceylon, Indo-China, Malaysia to Polynesia and tropical Australia.

W. Aust. Kimberley. Sunday Island (Fitzgerald 1916); Prince Regent River (Gardner 1923); King River (PERTH, Fitzgerald 1916).

Stenochlaena J. Smith

Stenochlaena palustris (Burmann f.) Beddome, *Suppl. Ferns Brit. Ind.* 26 (1876).

Polypodium palustre Burmann f. *Flora Ind.*, 234 (1768).

Acrostichum scandens (Swartz) Hooker, *Sp. Fil.* 5: 249 (1864).

Asia, Malaysia, Polynesia.

W. Aust. Synnott Range near Sprigg River (PERTH); Prince Regent River (PERTH); Sprigg and Charnley Rivers, in wet spots (Fitzgerald 1916).

DAVALLIACEAE

Nephrolepis Schott

Nephrolepis sp.

W. Aust. In boggy spots, Sprigg, Charnley and Hann Rivers, MacNamara Creek, base of Artesian Range, Edkins Range, Sunday Is., (Fitzgerald 1916, as *N. exaltata* (L.) Schott); Synnott Range (PERTH, as *N. exaltata* (L.) Schott).

ASPLENIACEAE

Asplenium Linnaeus

Asplenium adiantoides (Linnaeus) Lamarck, *Encycl. méth. Bot.* 2: 309 (1786).

Trichomanes adiantoides Linnaeus, *Sp. Pl.* 2: 1098 (1753).

Asplenium praemorsum Swartz, *Nov. Gen. & Sp. Pl. Prod.* 130 (1788).

Tropical and subtropical parts of all continents (Willis 1962).

W. Aust. Throughout the lower South-West and Eucla Divisions. Inhabiting fissures of granitic rocks or epiphytic on trees and fallen logs of the Karri forest. Leschenault (MEL); Harvey River (MEL); Mornington Mills (PERTH); Margaret River (UWA); Blackwood River (MEL); Mt. Cheedalup (PERTH); Pemberton (UWA, PERTH, MEL); Epiphytic on *Casuarina decussata* (Willis 1962); Warren River (MEL); Shannon River (MEL); Walpole (UWA); Bow River (UWA); Torbay (PERTH); Albany (MEL, PERTH, UWA); Porongurup Range (UWA, PERTH, MEL, NSW); Stirling Range (PERTH, MEL, UWA); Bald Is. (PERTH); Whoogarup Range (PERTH).

Asplenium flabellifolium Cavanilles, *Descr. Plant.* 257 (1802).

Temperate Australia, New Zealand.

W. Aust. Confined to damp, shaded places, usually amongst rocks, in the lower South-West from Karridale to Albany, Stirling Range and eastward to Israelite Bay. Karridale (MEL); Yallingup (UWA); Blackwood River (MEL); Pemberton (UWA, PERTH); Warren River (MEL); Nornalup (UWA); Albany (MEL, PERTH); Lake Muir (MEL); Porongurup Range (UWA, PERTH, MEL, NSW); Stirling Range (PERTH, Domin 1912, Lehmann 1846); Esperance (MEL); Lucky Bay (R. Brown 1810); Mount Ragged (PERTH).

Asplenium obtusatum Forster f., *Flor. Ins. Aust. Prod.* 80 (1786).

Asplenium marinum var. *obtusum* F. Muellcr in *Fragmenta* 5: 188 (1866).

Southern Australia, Sub-antarctic Islands, Tristan Da Cunha, Chile.

W. Aust. Breaksea Island in King George's Sound, amongst rocks (MEL, leg. G. Maxwell 1866; det., *Asplenium marinum* var. *obtusum* by F. Mueller 1866: 188). It is the only record of this maritime fern for W. Aust. Mueller (1896) listed this species again for Western Australia, probably in reference to the Maxwell collection from Breaksea.

Asplenium trichomanes Linnaeus, *Sp. Pl.* 2: 1080 (1753).

Temperate regions of the Old and New Worlds; mountainous districts of the tropics. Throughout southern Australia and New Zealand.

W. Aust. Common on limestone outcrops in the caves district between Capes Naturaliste and Leeuwin, in the lower South-West. Yallingup (UWA, PERTH, Ostenfeld 1921); Margaret River (UWA, NSW); Karridale (UWA); Augusta (UWA); Mount Manypeaks (PERTH).

Pleurosorus Fée

Pleurosorus rutifolius (R. Brown) Fée. *Mém. Fam. Foug.* 5: 179 (1852).

Grammitis rutaefolia R. Brown, *Prod.* 146 (1810).

Throughout Australia and New Zealand.

W. Aust. A rock fern of shaded recesses of granite, metasediments and limestone throughout the South-West. Laverton (PERTH); Coolgardie and Bullabulling (Moore, S. le M. 1899); Merredin Peak (PERTH); Wongan Hills (MEL); Yorkrakine Rock (UWA); York (MEL, UWA); Kelmscott (UWA); Darlington (Andrews 1902); Dwellingup (UWA); Narrogin (UWA); Wagin (MEL); Williams River (MEL); Mt. Stirling, S. of Kellerberrin (UWA); Stirling Range (MEL, NSW); Blackwood River (MEL); Albany (MEL); Whoogarup Range (PERTH); Esperance (MEL); Fraser Range (MEL, PERTH); Mt. Ragged (MEL); Lake Deborah (MEL. Helms in Muellier and Tate 1896); Madura Pass (MEL); Eucla (MEL, Willis 1959).

Pleurosorus subglandulosus (Hooker & Greville) Tindale in *Vic. Nat.* 73: 169 (1957).

Gymnogramma subglandulosa Hooker & Greville, *Icon. Fil.* 1: t. 91 (1827).

W. Aust. W. Aust. (Drummond No. 1000 in MEL); Gooseberry Hill, Darling Range (NSW); Lesmurdie, Darling Range (UWA); Swan View (PERTH); Mundaring Weir (PERTH); eastern sources of the Swan River (MEL); Chittering (PERTH); Wongan Hills (PERTH); Mornington Mills (PERTH); Glen Cumming Gorge near Giles, Rawlinson Range (AD).

Tindale (1957) claims this taxon to be specifically distinct from *P. rutifolius* because of the presence of glandular hairs on the fronds, whereas *P. rutifolius* has only non-glandular hairs. Also, *P. subglandulosus* is considered to be a larger plant than *P. rutifolius*. Willis (1962) regards this taxon as a variety of *P. rutifolius* partly on the grounds that, in Victoria, there occur plants with a mixture of both hair types as well as plants with either type of hairs.

I have examined 43 specimens of *Pleurosorus* from a wide area of distribution in Western Australia, and have found 33 plants with non-glandular hairs and 10 plants, as cited above, with glandular hairs. I doubt that there is any real difference in stature or robustness of fronds between the two taxa; our material of both varies considerably in frond size over the range of distribution of the genus.

A cytotaxonomic study of the two taxa would be interesting and might establish the validity of *P. subglandulosus* as a separate entity.

THELYPTERIDACEAE

Cyclosorus Link

Cyclosorus gongylodes (Schkuhr) Link, *Hort. Berol.* 2: 128 (1833).

Dryopteris gongylodes (Schkuhr) O. Kuntze, *Rev. Gen. Pl.* 2: 811 (1891).

Aspidium goggilodus Schkuhr. *Kryp. Gew.* 1: 193 (1809).

Aspidium unitum Swartz in *Schrad. J. Bot.* 32 (1800)[2], (1801).

Pantropical. Throughout northern Australia, extending to New South Wales in the east and thence to New Zealand where it is confined to thermal regions (Dobbie and Crookes 1951).

W. Aust. Throughout the Kimberley Division and extending sparsely to the South-West Division. "Aquatic, growing in running water along banks of streams. Prince Regent, Mitchell, Moran, King Edward and Drysdale Rivers in the Kimberley"— Gardner (1923) (PERTH); McNamara Creek and Charnley River in Kimberley (PERTH); Murchison River (PERTH); Lennard's Brook, near Gingin (UWA, PERTH); Wallcliff, at the mouth of the Margaret River (MEL).

BLECHNACEAE

Blechnum Linnaeus

Blechnum orientale Linnaeus, *Sp. Pl.* 2, 1535 (1763).

Tropics of Asia, Australia and the Pacific (Holttum 1954).

W. Aust. Throughout the Kimberley Division. Thompson's Springs on the Ord River (PERTH); Prince Regent River (PERTH); Imidjin Creek in McDonald Range (PERTH).

MARSILEACEAE

Marsilea Linnaeus

Marsilea angustifolia R. Brown, *Prod.* 167 (1810).

Northern and south eastern Australia to Victoria.

W. Aust. Throughout the Kimberley Division. "Bases of Mounts House, Clifton, Hamilton and Brennan. In wet spots chiefly around billabongs"—Fitzgerald 1916. In billabongs near the Isdell River (Gardner 1923); Mt. Hamilton (PERTH).

Marsilea drummondii A. Braun in *Linnaea* 25: 721 (1852).

Marsilea muelleri A. Braun in *Linnaea* 25: 721 (1853).

Australia.

W. Aust. Clay pans and creeks in the North-West, South-West and Eastern Divisions. Gascoyne River (UWA, Diels and Pritzel 1905); Gascoyne Junction (UWA); Murchison River Bridge (UWA); Mingenew (UWA); New Norcia (PERTH); Miling (PERTH); Mogumber (PERTH); York (PERTH); Upper Swan (UWA); Giles, in Rawlinson Range (AD).

Marsilea hirsuta R. Brown, *Prod.* 167 (1810).

Australia, excepting Tasmania.

W. Aust. Walcott Inlet, Duck Pool, Isdell River and near Mt. Marmion (Gardner 1923, PERTH); Gogo Station on Fitzroy River (PERTH); Carson and Meda Rivers (PERTH); South Barlee Range (PERTH); Yalgoo (PERTH); Geraldton (UWA); Rawlinson Range (AD).

Marsilea mutica Mettenius in *Ann. Sci. Nat., ser.* 4, 15: 88 (1861). Tindale in *Contr. N.S.W. natn. Herb.* 2: 8 (1953).

Marsilea brownii A. Braun in *Monatsber. Konigl. Preuss. Akad. Wiss. Berl.* 418 (1863) (1864).

Australia and New Caledonia.

W. Aust. Upper Carson River (PERTH, Gardner 1923); Gascoyne River (Mueller 1883); Nookawarra and Glenorn Stations in the North-West (PERTH); Mingenew (UWA); Waroona (PERTH); Coolup (PERTH); Fraser Range (Mueller and Tate 1896); Mt. Squires in Barrow Range (AD).

Tindale (1953), after comparing the holotypes of *Marsilea mutica* and *M. brownii* concludes they are conspecific. As Mettenius' name antedates that of Alexander Braun the species in Australia must now be known as *M. mutica*.

Pilularia Linnaeus

Pilularia novae-hollandae A. Braun in *Monatsber. Konigl. Preuss. Akad. Wiss. Berl.* 435 (1863) (1864).

Pilularia globulifera sensu Bentham, *Flora Aust.* 7: 684 (1878).

Australia.

W. Aust. An apparently rare species. Swan River (Drummond); Boyanup (PERTH); Harvey (PERTH). The Boyanup habitat is marshy depressions in pasture land.

AZOLLACEAE

Azolla Lamarck

Azolla filiculoides Lamarck in *Encycl. méth. Bot.* 1: 343 (1783).

Azolla rubra R. Brown, *Prod.* 167 (1810).

Azolla filiculoides Lamarck var. rubra (R. Brown) Strasburger, *Über Azolla 78 (1873).*

Australia and New Zealand. North and South America. Naturalised in Europe and Great Britain.

W. Aust. Common in still waters of swamps and creeks of the coastal plain near Perth. Moore River (MEL, PERTH, UWA); Gingin (UWA); Wanneroo, Bayswater, Bibra Lake and elsewhere near Perth (UWA, PERTH).

NATURALISED ESCAPES

CYATHEACEAE

Cyathea J. Smith

Cyathea australis (R. Brown) Domin, *Pteridophyta* 262 (1929). Tindale in *Contr. N.S.W. natn. Herb.* 2: 349 (1956).

Alsophila australis R. Brown, *Prod.* 158 (1810).

Victoria, Tasmania, New South Wales, Queensland.

W. Aust. Naturalised along the banks of Nerrigen Brook and adjacent creeks at Bedfordale. This treefern population developed from a single specimen planted by Mr. O. J. Dowell in 1934 in an orchard property on the Nerrigen Brook. About a hundred mature plants are at present to be seen along the brook and tributary creeks. Prothalli and sporelings are abundant on creek embankments where Bracken, scrub and grasses afford sufficient shelter.

SALVINIACEAE

Salvinia Adanson

Salvinia auriculata Aublet, *Hist. Pl. Guiane franc.*, 969 (1775).

Central and South America.

W. Aust. An ornamental of garden ponds. A naturalised escape in the freshwater reaches of the Canning River (UWA, PERTH), and in a swamp at Harvey (UWA, PERTH). The Harvey collection was noted by Smith (1960) under the name of *Salvinia rotundifolia.*

Acknowledgments

The author is grateful to the following herbaria personnel for their assistance in making available their pteridophyte collections for research and for their advice on problems arising in this work: Mr. R. D. Royce, Curator, Western Australian Herbarium; Dr. Hj. Eichler, The Keeper, and Mr. P. Wilson of the State Herbarium of South Australia; Mr. R. T. M. Pescott, The Director of the Royal Botanic Gardens and National Herbarium of Victoria and Mr. J. H. Willis, Assistant Government Botanist, National Herbarium of Victoria; Mr. R. H. Anderson, Director, and Dr. M. D. Tindale, Special Botanist, of the Royal Botanic Gardens and National Herbarium of New South Wales; Dr. N. T. Burbidge, Division of Plant Industry, C.S.I.R.O. Canberra; and Dr. R. D. Hoogland, Division of Land Research and Regional Survey, C.S.I.R.O., Canberra.

The author is also indebted to Mr. N. G. Marchant and to several of his past students for their assistance in collecting pteridophytes for the Herbarium of the University of Western Australia.

Referenees

Alston, A. H. G. (1956).—The subdivision of the Polypodiaceae. *Taxon* 5: 23-5.

————————(1961).—Notes on *Selaginella.* 1. Nomenclatural notes on seven species. *J. Bot., Lond.* 69: 251-58.

Andrews, C. R. P. (1902).—Notes on Stylidieae (etc). *J. & Proc. Muell. Bot. Soc.* 1 (9): 19-20.

————————(1902).—Ferns of the Perth district. *J. & Proc. Muell. Bot. Soc.* 1 (10): 40.

Aublet, F. (1775).—"Histoire des plantes de la Guiane francoise, ..." (Didot: London & Paris.)

Australia: Bureau of Meteorology (1956).—"Climatic Averages Australia" (Melbourne.)

Beddome, R. H. (1876).—"Supplement to the Ferns of Southern India and British India." (Gantz Bros.: Madras.)

Bentham, G. (1878).—"Flora Australiensis." Vol. 7: 670-781. (Reeve: London.)

Black, J. M. (1943).—"Flora of South Australia." Second Edition. (Govt. Printer: Adelaide.)

Blackall, W. E. (1954).—"How to know Western Australian Wildflowers." Part 1. (Univ. W. Aust. Press: Nedlands.)

Braun, A. (1853) (1852).—Marsiliaceae & Isoëteae in Plantae Muellerianae. *Linnaea* 25: 721-22.

————————(1863) (1864).—Über die Marsiliaceen—Gattungen *Marsilia* und *Pilularia. Mber. K. Akad. Wiss. Berl.* 1863: 413-36.

————————(1868).—Über die Australischen Arten der Gattung *Isoetes. Mber. K. Akad. Wiss. Berl.:* 523-45.

Brongniart, Ad. (1821) (1822).—Description d'un noveau genre de fougères, nommé *Ceratopteris. Bull. Soc. Philomath. Paris.* 1821: 184-87.

Brown, R. (1810).—"Prodromus Florae Novae Hollandiae et Insulae Van-Diemen, 1." (London.)

Burmann, N. L. (1768).—"Flora Indica: nee non prodromus florae capensis." (Leiden.)

Cavanilles, A. J. (1802).—"Descripcion de las plantas que D. Antonio Josef Cavanilles demostrè en las lecciones publicas del ano 1801." (Madrid.)

Cheeseman, T. F. (1906).—"Manual of the New Zealand Flora." (Govt. Printer: Wellington.)

Ching, R. C. (1933).—The studies of Chinese ferns—XI. *Contr. Inst. Bot. natn. Acad. Peiping.* 2: 31-100.

Christensen, C. F. (1905-06).—"Index Filicum", and Supplements 1-3 (1913, 1917, 1934). (Hagerup: Copenhagen.)

————————(1938).—Filicinae, as chapter 20 *In* Verdoon, Fr. "Manual of Pteridology." (Martinus Nijhoff: The Hague.)

Clarke, C. B. (1880).—A Review of the Ferns of Northern India. *Trans. Linn. Soc. Lond.* 2nd Sr. *(Bot.)* 1: 425-611.

Clausen, R. T. (1938).—A monograph of the Ophioglossaceae. *Mem. Torrey bot. Club.* 19 (2): 1-177.

Copeland, E. B. (1929).—The Oriental Genera of Polypodiaceae. *Univ. Calif. Publ. Bot.* 16: 45-128.

————————(1947).—"Genera Filicum." (Chronica Botanica: Watham, Mass.)

Cunningham, A. (1836).—Florae insularum novae zelandiae preeursor; or a specimen of the botany of the islands of New Zealand. *Hook. Comp. bot. Mag.* II: 358-78.

Desvaux, A. N. (1811).—Observations sur quelques noveaux genres de fougères et sur plusieurs espéces nouvelles de la même famille. *Mag. Geschl. Naturf. Berl.* 5.

————————(1827).—Prodrome de la famille des fougères. *Mém. Soc. Linn. Paris* 6.

Diels, L. & Pritzel, E. (1905).—"Fragmenta Phytographiae Australiae occidentalis." (Engelmann: Leipzig.)

Dobbie, H. B. & Crookes, M. A. (1951).—"New Zealand Ferns." (Whitcombe & Tombs: Wellington.)

Domin, K. (1912).—Additions to the flora of Western and North-Western Australia. *J. Linn. Soc. (Bot.)* 41: 245-83.

————————(1913).—"Beiträge zur Flora und Pflanzengeographie Australiens" 1. Abt. Pteridophyta. *Bibl. Bot.*, 85: 1-238.

————————(1928).—Generis *Pityrogramma* (Link) species ae sectiones in clavem analyticam dispositae. *Publ. Fac. Sci. Univ. Charles, Prague.* No. 88: 3-10.

Eames, A. J. (1936).—"Morphology of Vascular Plants—Lower Groups." (McGraw-Hill: New York.)

Fée, A. L. A. (1852).—"Genera Filicum—Exposition des genres de la famille des Polypodiacées (Classe des Fougères) (including Cinquiéme Mémoire sur la famille des fougères)." (Paris-Strasbourg.)

Fitzgerald, W. V. (1901).—Some indigenous plants new to West. Aust. *Vic. Nat., Melb.* 18: 104.

————————(1903).—Notes on some new species of West. Aust. plants. *J. Muell. bot. Soc.* 1 (11): 82.

————————(1916).—The botany of the Kimberleys, North-West Australia. *J. Proc. R. Soc. West. Aust.* 3: 102-224.

Forster, G. (1786).—"De plantis esculentis insularum oceani australis. Commentatio botaniea." (Berlin.)

————————(1786).—"Florulae Insularum Australium Prodromus." (Gothenburg.)

Gardner, C. A. (1923).—Bot. notes. Kimberley Division of W. Aust. *Bull. For. Dept. West. Aust.* No. 32.

————————(1930).—"Enumeratio plantarum australiae occidentalis." (Govt. Printer: Perth.)

————————(1942) (1944).—The vegetation of Western Australia with special reference to the climate and soils. Presidential Address, 1942. *J. Roy. Soc. W. Aust.* 28: xi-lxxxvii.

————————& Bennetts. H. W. (1956).—"The toxic plants of West. Aust." (W. Aust. Newspapers Ltd.: Perth.)

Giles, E. (1875).—Geographic travels in Central Australia. Plants collected by Giles during his geographic exploration of Central Australia in 1872, 1873 and 1874, examined by F. von Mueller. pp. 209-23. (McCarron, Bird: Melbourne.)

Herzog, R. (1935).—Ein Beiträge zur Systematik der Gattung *Salvinia. Hedwigia* 74: 257-84.

Heironymous, von G. (1914).—Beiträge zur Kenntnis der Gattung *Pteris.* 1. Über *Pteris longifolia* L. und verwandte Arten. *Hedwigia* 54: 283-94.

Holttum, R. E. (1946).—A revised classification of Leptosporangiate ferns. *J. Linn. Soc. (Bot.)* 53: 123-58.

————————(1954).—"A revised flora of Malaya. II Ferns of Malaya." (Govt. Printing Office, Singapore.)

———————(1956).—On the nature and possible relationships of the fern genus *Platyzoma* R. Br. *Kew Bull.* 1956: 551-53.
———————(1959).—Gleicheniaceae & Schizaeaceae *In* "Flora Malesiana," Ser. II—Pteridophyta. Vol. 1, pp. 1-61. (Noordhoff: Groningen.)
Hooker, W. J. (1840).—"Genera Filicum; or Illustrations of the Ferns and other allied genera." (G. Bohn: London.)
———————(1844).—"Species Filicum 1." (W. Pamplin: London.)
———————& Greville, R. K. (1827-1831).—"Icones Filicum.," Vols. I & II. (Treuttel & Richter: London.)
Kuntze, Otto (1891).—"Revisio generum plantarum ..." 2: 375-1011 (Leipzig.)
Kunze, G. (1847).—Lycopodiaceae and Polypodiaceae *In* Lehmann, C. "Plantae Preissianae sive Enumeratio Plantarum ..." Vol. II. pp. 108-13.
———————(1847a).—Hortus Universitatis litcrarium Lipsiensis seminum anno 1845 perceptorum offert delectum. *Linnaca* 19: 494-07.
Labillardière, J. J. (1806).—"Novae Hollandiae plantarum specimen," Vol. 1. (Huzard: Paris.)
Lamarck, J. B. de. (1783).—"Encyclopédie méthodique. Botanique." Vol. 1. (Paris.)
———————(1786).—"Encyclopédie méthodique. Botanique." Vol. 2. (Paris.)
Lehmann, C. (1846-47).—"Plantae Preissianae sive Enumeratio plantarum quas in Australasia occidentali et meridionali-occidentali annis, 1833-41 collegit Ludovicus Preiss." Vol. II. pp. 1-499. (Hamburg.)
Lindsay, D. (1893).—"Journal of the Elder Scientific Exploring Expedition, 1891-2." with maps. (Govt. Printer: Adelaide.)
Link, H. F. (1833).—"Hortus regius botanicus Berolinensis descriptus." (Berlin.)
———————(1841).—"Filicum species in Horto regio botanico Berolinensis cultae." (Berlin.)
Linnaeus, C. (1753).—"Species Plantarum." Vol. II (Stockholm.)
———————(1759).—"Systema Naturae." cd. 10. Vol. 2, pp. 825-1384. (Stockholm.)
———————(1763).—"Species Plantarum II, ed. 2. (Stockholm).
———————(1771).—"Mantissa plantarum." (Stockholm).
Maiden, J. H. (1917).—Notes on *Aeacia,* No. 2—Tropical Western Australia. *J. & Proc. Roy. Soc. N.S.W.* 51: 71-124.
Manton, I. (1958).—Chromosomes and fern phylogeny with special reference to "Pteridaccae." *J. Linn. Soc. Lond. Bot.* 56: 73-92.
Mettenius, G. (1859).—Über einige Farngattungen. V. *Cheilanthes. Abh. senckenb. naturforsch. Ges.* 3.
———————(1861).—Filices Novae Caledoniae, A Cl. Vieillard collectae. *Annls. Sci. Nat.* 15: 55-88.
Moore, S. Le M. (1899).—The botanical results of a journey into the interior of Western Australia; with some observations on the nature and relations of the desert flora. *J. Linn. Soc. (Bot.)* 34: 171-261.
Moore, T. (1857).—"Index Filicum ..." (W. Pamplin: London.)
Mueller, F. (1864).—"The vegetation of the Chatham—Islands." (Govt. Printer: Melbourne.)
———————(1866).—"Fragmenta Phytographiae Australiae." Vol. 5, pp. 111-142. (Govt. Printer: Melbourne.)
———————(1874).—"Fragmenta Phytographiae Australiae." Vol. 8, pp. 175-80. (Govt. Printer: Melbourne.)
———————(1881).—"Plants of North-West. Aust." (Govt. Printer: Perth.)
———————(1882).—"Systematic census of Australian plants." (Govt. Printer: Melbourne.)
———————(1883).—"The plants indigenous around Shark Bay and its vicinity." (Govt. Printer: Perth.)
———————(1889).—"Second systematic census of Australian plants." (Govt. Printer: Melbourne.)
———————(1896).—List of extra-tropical West Australian Plants (Vasculares), *In* Fraser, M.A.C.—"West. Aust. Year-Book for 1894-95." (Govt. Printer: Perth.)
———————& Tate, R. (1896).—Scientific Results of the Elder Exploring Expedition, Botany. *Trans. Roy. Soc. S. Aust.* 16: 333-83.
Nakai, T. (1925).—Critical notes on Japanese ferns with special references to the allied species. *Bot. Mag. Tokyo.* 39: 101-21.
———————(1950).—New classification of Gleicheniales, etc. *Bull. Nat. Sci. Mus., Tokyo* No. 29: 1-71.
Ostenfeld, C. H. (1921).—Contrib. to W. Aust. Bot. Part III—Additions and notes to the flora of extra-tropical W. Aust. *Det. Kgl. Danske Viden. Salskab. Biol. Medd.* III, 2, 1-144.
Pfeifer, N.E. (1922).—Monograph of the Isoetaceae. *Ann. Mo. bot. Gdn.* 9: 79-232.
Pichi-Sermolli, R. E. G. (1951).—Notes on some Australian Ferns. *Webbia* 8: 201-24.
———————(1953).—The publication date of Fée's Genera Filicum. *Webbia* 9: 361-66.
———————(1956).—Names and types of fern genera—1. Hymenophyllopsidaceae, Loxsomaceae, Schizaeaceae. *Webbia* 12: 1-40.
———————(1957).—Adumbratio Florae Aethiopicae. 5. Parkeriaceae, Adiantaceae, Vittariaceae. *Webbia* 12: 645-703.
———————(1957a).—Names and types of fern genera—2. Angiopteridaceae, Marattiaceae, Danaeaceae, Kaulfussiaceae, Matoniaceae, Parkeriaceae, Adiantaceae. *Webbia* 12: 339-74.
———————(1962).—Adumbratio Florae Aethiopicae. 8. Gleicheniaceae. *Webbia* 17: 33-43.
Retzius, A. J. (1788).—"Observationes botanicae Fasiculus observationum botanicarum quintus." (Leipzig.)
Schkuhr, C. (1809).—"Vier und zwanzigste Klasse des Linnéischen Pflanzensystems oder Kryptogamische Gewächse." Vol. 1. (Wittenberg.)
Schott, H. W. (1834).—"Genera Filicum." (Vienna.)
Skottsberg, C. (1944).—Vascular plants from the Hawaiian Islands. III Pteridophytes collected during the Hawaiian Bog Survey 1938. *Aeta Horti gothoburg.* 15: 35-148.
Smith, G. G. (1960).—*Salvinia rotundifolia* in West. Aust. *W. Aust. Nat.* 7: 108.
———————(1962).—The flora of granite rocks of the Porongurup Range, South Western Australia. *J. Roy. Soc. W. Aust.* 45: 18-23.
———————& Butler, R. J. (1961).—*Psilotum nudum* at the Murchison River. *W. Aust. Nat.* 7: 190.
———————& Marchant, N. G. (1961).—A census of aquatic plants of West. Aust. *W. Aust. Nat.* 8: 5-17.
Smith, J. (1841).—Enumeratio Filicum Philippinarum. *Hook. J. Bot.* 3: 392-422.
Spring, A. (1849-1850).—Monographie de la famille des lycopodiacées, II. *Mém. Acad. R. Belg.* 24: 358.
Stafleu, F. A. (1963).—Dates of Botanical Publications 1788-1792. *Taxon* 12: 41-87.
Strasburger, E. (1873).—"Über *Azolla.*" (G. Fiseher: Jena.)
Swartz, O. (1788).—"Nova Genera et Species Plantarum Prodromus descriptionum vegetabilium, maximum partem incognitorum quae sub itinere In Indiam occidentalem Annis 1783-87." (Stockholm.)
———————(1800)[2], (1801).—Genera et Species Filicum ordine systematico redactarum ... *Schrad. J. Bot.* 77.
———————(1806).—"Synopsis Filicum, carum genera et species systematice complectius." (Kiel.)
Thunberg, C. P. (1800).—"Prodromus Plantarum Capensium, quas in Promontorio Bonae Spei Africes Annis 1772-1775 collegit C. P. Pars posterior." (Edman: Uppsala.)
Tindale, M. D. (1953).—Studies in Aust. pteridophytes No. 1. *Contr. N.S.W. natn. Herb.* 2 (1): 5-12.
———————(1956).—The Cyatheaceae of Australia. *Contr. N.S.W. natn. Herb.* 2: 327-61.
———————(1957).—A new combination in *Pleurosorus. Vict. Nat. Melb.* 73: 169-70.
———————(1958).—The Pteridophyta of Arnhem Land, *in* "Records of American-Australian sci., expedition to Arnhem Land." 3. Botany and Plant Ecology. (Melb. Univ. Press: Melbourne.)
———————(1960).—Vein patterns in *Microsorium scandens* and its allies. *Am. Fern. J.* 50: 241-45.

———————(1962).—Pteridophyta *In* Beadle N.C.W., Evans, O.D., and Carolin, R.C. "Handbook of the Vascular Plants of the Sydney District and Blue Mountains." (Brown Gem: Armidale.)
Tryon, Jr., R. M. (1941).—A revision of the genus *Pteridium*. *Rhodora* 43: 1-31, & 37-67.
Underwood, L. M. (1907).—American ferns—viii. A preliminary review of the North American Gleicheniaceae. *Bull. Torrey bot. Club* 34: 243-62.
Verma, S. C. (1957).—Cytology of *Ophioglossum coriaceum A. Cunn. Cytologia* 22: 393-403.
Wakefield, N. A. (1955).—"Ferns of Victoria and Tasmania." (Field Nat. Club, Vic: Melbourne.)
Willdenow, K. L. (1810).—"Coroli a Linné Species plantarum." ed. 4. Vol. 5. (Berlin.)
Willis, J. H. (1951).—Botany of the Russell Grimwade Expedition. *Mem. nat. Mus. Melb.* No. 17: 33-64.
———————(1953).—The Archipelago of the Recherche. Part 3a, Land flora. *Aust. geogr. Soc. Rep.* No. 1.
———————(1959a).—Plants of the Recherche Archipelago, West. Aust. *Muelleria* 1: 97-101.
———————(1959b).—Notes on the vegetation of Eucla district, W.A. *Muelleria* 1: 92-6.
———————(1962).—"A handbook to plants in Victoria," Vol. 1. (Melb. Univ. Press: Melbourne.)